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A Methodology for Evaluation of PREP Area Exercises

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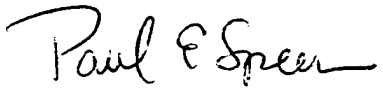

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For many years, the Center for Naval Analyses (CNA) has been charged with reconstructing and analyzing the Navy's major fleet exercises. Before deploying, a carrier battle group completes its work-up cycle by participating in a major exercise war. CNA provides reconstruction and analysis support at the request of the fleet commanders, who need an objective evaluation of their battle group's tactics and readiness. On 26 and 27 September 1995, Commander, Naval Base San Diego and Fleet Industrial Supply Center, Sand Diego hosted the 1995 San Diego Preparedness for Response Exercise Program (PREP) Area Exercise. This report documents our evaluation methodology, and offers a suggested evaluation plan for use in future PREP area exercises.

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Contents

Summary

For many years, the Center for Naval Analyses (CNA) has been charged with reconstructing and analyzing the Navy's major fleet exercises. Before deploying, a carrier battle group completes its work-up cycle by participating in a major exercise war, conducted at sea with real ships, submarines, and planes in a scenario relevant to the part of the world to which it will deploy. CNA provides reconstruction and analysis support at the request of the fleet commanders, who need an objective evaluation of their battle group's tactics and readiness.

On 26 and 27 September 1995, Commander, Naval Base San Diego (COMNAVBASE) and the Fleet Industrial Supply Center, San Diego (FISC) hosted the 1995 San Diego PREP Area Exercise. The Navy had participated in previous PREP exercises, but this is the first time it had led one. Because this exercise was important, both in terms of public visibility and in developing a standard procedure for evaluating future Navy-led PREP exercises, COMNAVBASE asked CNA to serve as evaluation director for the exercise, and to provide the type of analytical support we routinely provide for major fleet exercises.

This report documents our evaluation methodology, and offers a suggested evaluation plan for use in future PREP area exercises.

What is PREP?

Section 311 of the Federal Water Pollution Control Act (the Clean Water Act) of 1972 required the formation of a National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This resulted in 40 CFR-300, which set out the National Response System for dealing with oil and hazardous substance emergencies.

The *Exxon Valdez* disaster of March 1989 revealed serious shortcomings in this nation's ability to deal with a major oil spill, and resulted

in the passage of the Oil Pollution Act of 1990 (OPA-90), which mandated revision of the NCP. One revision was to separate response requirements for oil spills from those for other hazardous substances. In general, OPA-90 called for increased preparedness for major oil spills by requiring formation of area committees and area contingency plans, and periodic exercises. It was in response to this requirement for periodic exercises that the U.S. Coast Guard (USCG), Environmental Protection Agency (EPA), Research and Special Programs Office of Pipeline Safety (Department of Transportation), and the Minerals Management Service developed the Preparedness for Response Exercise Program (PREP).

For the purpose of oil spill response, the country is divided into 60 areas, each of which has its own detailed response plan, known as an Area Contingency Plan (ACP). The PREP program conducts 20 area exercises per year, so that each ACP is exercised once every three years. Leadership responsibility (organizing, hosting, and assuming a large share of the funding) for each exercise is assigned by the USCG; plans call for 14 industry-led and 6 government-led exercises per year. Navy-led exercises are considered industry led because, for the purpose of oil spills, the Navy is simply a member of the regulated community and is subject to regulation as is any other industrial operation. Government-led exercises are led by the USCG.

Each PREP exercise is put together by a design team composed of representatives of each of the major participating agencies. PREP guidelines [1] describe 15 "core components" of a response which should be exercised and evaluated. The design team decides which of the 15 could be worked into the exercise, with the local Coast Guard District Commander holding final say in matters of exercise design.

Summary

In this report, we summarize the methodology we used in serving as evaluation director for the San Diego 1995 PREP area exercise, and

offer it as a blueprint for future evaluation efforts. This report suggests that:

- PREP evaluation should focus on organizational issues and on the ability of the response organization to execute the various plans. The evaluation should examine:
  - — How the response command structure was organized, and how quickly and efficiently it was formed
  - — How well it functioned once it was formed
  - — The degree to which the response organization was able to address the tasks and priorities called for in the contingency plans.
- An exercise such as PREP, in which no oil is actually spilled, does not permit an evaluation of how well the spill contingency plan works. Those exercise objectives dealing with actual response performance, such as discharge control, ability to contain or recover oil, and ability to dispose of oil and oily debris, cannot be directly evaluated in such an exercise. These issues could be addressed by examining when they were considered, by whom in the response organization, and what plans were made for dealing with these issues.

Organization of this report

This report is organized as follows:

- The section following this introduction comprises the bulk of this report. In it we discuss general evaluation goals, and present a plan for addressing each of the 15 standard evaluation objectives given in [1].
- In the following section, we describe the general evaluation methodology, and address personnel and data requirements.

Evaluation objectives

Table 1 lists the 15 core components of a spill response plan, which should be played and evaluated in a PREP area exercise [1]. PREP guidelines acknowledge that it might not be possible to meet every one of these objectives in a given area exercise. For each exercise, the exercise design team should decide which of these components can be played and evaluated in its particular exercise.

Table 1. PREP 15 standard exercise objectives (from [1])

Objective number	Title/description
1	Notifications
2	Mobilization
3	Operate within a Unified Command System
4	Discharge control
5	Assessments
6	Containment
7	Recovery
8	Protection
9	Disposal
10	Communications
11	Transportation
12	Personnel support
13	Equipment
14	Procurement
15	Documentation

In this section, we will discuss each of these 15 standard exercise objectives, and offer suggestions for addressing them in an evaluation. For each, we describe the issue and discuss ways to evaluate the exercise responses in meeting these objectives. In many cases, we use

the San Diego Area Contingency Plan as a baseline for assessing events (i.e., what should happen).

Notifications

PREP guidelines state that the exercise should "test the notification procedures identified in the Area Contingency Plan and the associated responsible party plans" [1].

The initial notification process is critical to an actual response. Despite the obvious exercise limitations in realistically playing out the notification process, the evaluation should address notifications to the extent possible.

Should there be a real spill, the law requires that the vessel or facility experiencing the spill must call the U.S. Coast Guard (USCG) National Response Center (NRC); the NRC then calls the local USCG On-Scene Coordinator (OSC). In the case of San Diego, the USCG OSC is to notify the State Office of Emergency Services (OES). OES then has a long list of agencies to notify, depending on the circumstances of the spill.

For a PREP exercise, all players should be required to make the necessary phone calls, and the evaluation should assess the response to three questions:

- Does everyone know whom to call?
- How quickly are notifications completed?
- Are all the contacts listed in the plans current?

The evaluation should also assess whether all necessary agencies are included in the appropriate notification lists. For example, in San Diego, our search of the ACP showed that a few local agencies which played roles in the response were not included on notification lists and thus were not notified early in the event.

Somewhere in the Incident Command System (ICS), the notification process must be documented. The evaluation should address the issue of record keeping associated with the notification process.

Mobilization

With respect to mobilization, PREP guidelines state that the exercise should "Demonstrate the ability to assemble the spill response organization identified in the ACP and the associated responsible party plans"[1].

In San Diego, we took a slightly more general approach to this objective. We interpreted "mobilization" to refer to bringing the command together, bringing emergency assets in quickly, and performing those tasks required within the first two hours. In a real spill, these initial actions would be critical for discharge control and initial assessment.

For the most part, mobilization is not really played in exercises such as PREP. Because these are not "no-notice" exercises, most responders are on scene much more quickly than they would be in a real spill. In fact, in San Diego players from a few agencies were on scene before they were even notified.

We can address mobilization in the evaluation by looking at how quickly the various cells in the response organization are formed and staffed. If the time required is too artificially low because everyone is already in place, the evaluation should look to see if everyone knows what must be done—according to the plan—within the first two hours.

It is also interesting to examine how the plan is used early in the response. Do people actually break it out and look to see what their responsibilities are? Does the plan help, or get in the way?

Operate within a UCS

This objective—"Ability to operate within the Unified Command System" (UCS)—is very broad, and could encompass almost the entire evaluation.

What does "operating within the UCS" mean? It means a UCS must be formed, and all parts of the UCS must accomplish their missions. This is a bottom-line objective: *Does this structure facilitate getting the job done?* Therefore, the evaluation should try to relate observations

concerning these organizational issues to their impact on the actual spill response.

Under this broad umbrella, the evaluation could address the following issues:

- Are all individual agency plans and concerns combined into a single plan?
- Do all players work together on a single staff, or does each agency pursue its own agenda?
- How integrated are the agencies? Does information flow easily among the different agencies that make up each cell, including the UC cell and all others?
- How well does information flow among the cells? Is critical information the same when seen from all cells?
  - — At the most basic level, does the UC always know what everyone is doing?
- How does each staff coordinate and direct its mission? Can each cell accomplish its assigned tasks, or is it overwhelmed?

Discharge control

For this objective, PREP guidelines state: "Demonstrate the ability of the spill response organization to control and stop the discharge at the source" [1].

Discharge control would of course be of great importance in an actual spill, but there isn't much we can do with this objective in an exercise in which there is no actual spill. (In San Diego PREP, the vessel master handled all matters related to discharge control, and no one associated with the exercise questioned or attempted to evaluate the actions of the vessel master in handling his ship.)

In San Diego PREP, we simply noted how and when this was considered by the UC, and how much effort was directed toward it until exercise control declared the discharge to be under control.

Assessments

This objective refers both to the initial assessment of the spill and to continuous assessments of how the response is proceeding.

The evaluation should note the time of the first assessment of spill size and the time at which this initial estimate is updated. Not much can be done regarding the accuracy of the initial assessment; because there is no actual spill, the assessment consists of the exercise controllers telling the player in question what they "saw as they flew over the spill in a helicopter."

The evaluation could try to determine how often assessments are updated. In a one-day exercise, we won't see many updates, but perhaps we can determine what the long-term intention is in this regard.

The evaluation should examine who performs the assessments and to whom results are sent. Does information from the periodic assessments flow to all those in the response organization who could benefit from it? The most important issue is: How are the assessments acted upon? The evaluation should look for specific instances in which the assessment led to changes in plans or operations.

Containment

For this objective, PREP guidelines require the exercise to "Demonstrate the ability of the spill response organization to contain the discharge at the source or in various locations for recovery" [1].

Initial containment is one of the highest priorities in an oil spill response. However, in an exercise there is no oil to contain. To address containment, the evaluation should discuss the proposed booming strategy, particularly that which occurs immediately after the spill. If some boom is actually deployed at the site of the exercise spill (as was the case in San Diego), the timeliness of that evolution should be addressed.

Recovery and disposal

With respect to recovery, the PREP guidelines state that we needn't actually pick up any oil. We simply must:

- Demonstrate the ability to assemble and deploy the on-water resources identified in the Incident Action Plan (IAP)
- Demonstrate the ability to assemble and deploy the shoreside cleanup resources identified in the IAP.

With respect to disposal, we must:

- Demonstrate the ability of the spill response organization to dispose of the recovered material and contaminated debris.

No oil is actually recovered or disposed of during a PREP exercise, so there isn't much the evaluation team can do with these issues.

Due to the volatility of oil (particularly light oils, such as DFM), and its tendency to disperse throughout the water column, the best time to recover oil from the water is as soon as possible after it is spilled. Therefore, recovery success is highly dependent on the ability to get recovery equipment in action as soon as possible.

The evaluation should note what the ACP called for with respect to recovery and disposal. To evaluate recovery, an assessment of how quickly assets could be brought on scene could be attempted. For disposal, the evaluation could comment on when and how the disposal task was considered by the response organization.

Protection

Protection is, of course, the main thrust of the exercise. This broad objective consists of several more specific objectives:

- Protective booming
- Dispersants, in-situ burning, and bioremediation
- Water intake protection
- Wildlife recovery and rehabilitation
- Population protection.

To evaluate booming, the evaluation should trace the thought process behind the booming strategy employed. For example, immediate containment booming is not appropriate in cases where there is a potential for fire or explosion. The evaluation could look to see whether this or similar issues were considered. The evaluation should also compare the exercise booming strategy with the protection priorities set forth in the ACP and the facility response plan.

Dispersants, burning, and bioremediation are to be used only in cases where the preferred method (pickup) is inadequate. Decisions on the use of these methods must be reached early in the response. The evaluation should look at when these options were considered, by whom, when a decision was made, and why.

Water intakes are among the highest priorities of the "economically sensitive" areas. For this objective, the evaluation could report if and when this issue was considered. If there was indeed a potential threat, was it accorded the priority dictated by the plan, and what actions were taken? Similarly for wildlife protection and recovery, the evaluation should ask: When and how were these issues considered?

Of course, population protection is the highest of all priorities. The evaluation must look at what decisions were made in this regard. When and how were public health concerns accounted for? Was there any additional information the UC would have needed to assess the potential threat to humans?

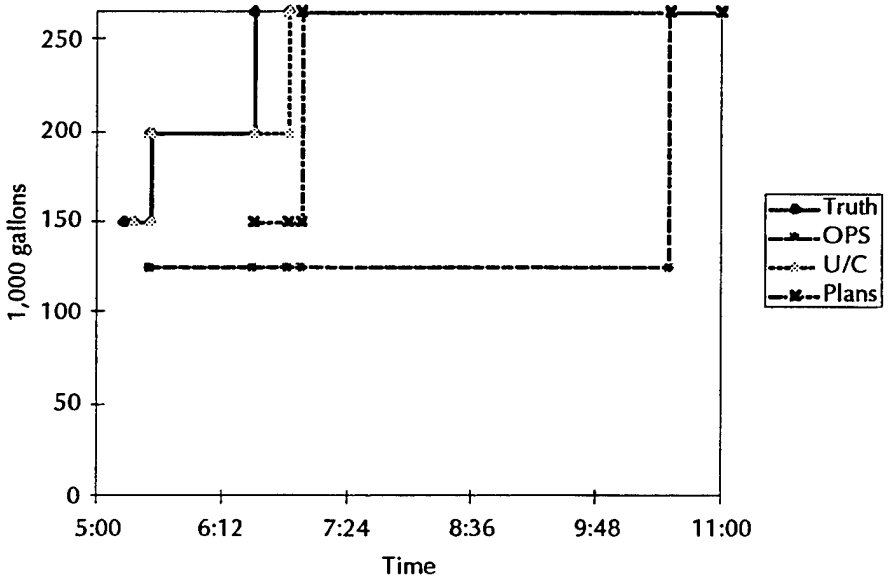
Communications

This objective includes both internal (within the command) and external (to units out on the water) communications. Communications and the related information flow are critical to the success of a complex command structure such as an ICS, and will be a high priority of the evaluation.

Comparing the information held in the various cells is a useful tool for assessing the flow of information. An example of one tool for doing this is shown in figure 1, from the San Diego evaluation. It shows the volume of oil spilled, as a function of time, as seen from

four views: the true volume, based on controller updates provided to the vessel master at the scene; the volume assumed in the U/C Cell; the volume assumed in the Operations Cell; and the volume assumed in the Planning Cell. In a perfect organization, this critical information, on which presumably almost all decisions would be based, should flow immediately from the vessel to the U/C Cell, then out to all other cells.

Figure 1. Volume spilled, as seen from four views



The flow of this information from the vessel to the U/C went reasonably well, but the flow from the U/C to the Operations Cell did not go as well. During a critical 4-hour period early in the response, Operations thought they were dealing with a 125,000 gallon spill when in fact U/C knew the volume was 265,000 gallons.

The evaluation should generally evaluate how effectively the communications load was managed. Were sufficient communication lines (phones) available in the command spaces, or were they constantly overloaded? How were internal communications passed: by phone, or

simply by word of mouth? If any computer-based information systems were used, their utility should be documented.

Transportation

With respect to this objective, PREP guidelines state that we must: "Demonstrate the ability to provide effective multi-mode transportation both for execution of the discharge and support functions" [1].

In a typical ICS organization, transportation is primarily the responsibility of the Logistics section. They are to ensure prompt delivery of necessary resources, and keep the UC informed on the status of all procurements.

An analysis of logistics issues should start by looking at information flow: Who tells the Logistics Cell what assets to move, and when? Is the Logistics Cell given severe time constraints? After arranging transportation, what does Logistics brief to the UC? Does the UC then use this information in adjusting plans and operations?

The use of newly arriving assets should also be evaluated. Is tasking coordinated well in advance, so that when assets are brought in they are put right to work, or could we have a situation in which assets are on hold while awaiting tasking?

A documentation of the time it takes for assets to actually arrive on scene would be very informative. However, it is generally hard to derive this information from a PREP exercise because the involved agencies know about the exercise ahead of time, and in fact often have equipment and people in place before the time of the spill.

Equipment maintenance and support

This objective calls for exercise participants to "Demonstrate the ability to maintain and support all equipment associated with the response" [1].

A PREP one-day area exercise does not allow us to do very much with this objective. For San Diego, we simply noted which agencies provided response equipment, and whether or not they brought support

infrastructure with them (in the case of out-of-town agencies). (In the case of the Navy, SUPSALV assets are always accompanied by an extensive support infrastructure.) The evaluation could note whether or not this issue was considered in the response command organization, and if so, how.

Personnel support

The personnel support objective includes:

- Management
- Messing and berthing
- Operational and administrative spaces
- Emergency procedures.

Evaluation of management issues could include a discussion of the time needed to organize the command structure. Management also includes coordinating personnel assignments, developing the watch bill for headquarters staff, and moving people in and out of response headquarters. In the evaluation, any observation about administrative logistics (i.e., people getting lost and not knowing where their spaces are, badge confusion, etc.) should acknowledge that this is to be expected on opening day, and no doubt would rapidly shake out in another day or two. The evaluation should note a problem along these lines only if it appears a real issue exists.

For a spill in a major city or adjacent to a large military installation, finding bunks and meals for the responders should not be a major problem. A paragraph or two about where and how people would actually be lodged and fed is probably sufficient.

The evaluation should report on the layout of response headquarters spaces, whether or not staff spaces were large enough, and whether there were any obvious problems with the layout. This information will be available in player debriefs which occur immediately following the exercise. If possible, the evaluation should address how well the layout facilitated information flow among cells.

Emergency procedures are generally the responsibility of the safety staff. The evaluation should look at the issues considered by the safety staff:

- What, specifically, will personnel be doing that is dangerous?
- What are the potential injuries?
- Is there enough danger to warrant standby medical teams?
- Are there standards in this industry for on-scene medical support, and if so, are they met?

The evaluation should note when and by whom these issues are addressed.

Procurement

This objective covers procurement of personnel and of response and support equipment.

In San Diego PREP, timely procurement of response gear was often impeded by communication problems between the Operations Cell, which decides what response equipment is needed, and the Logistics Cell, which locates the equipment and orders it. An evaluation of procurement issues must include a look at the ever present issue of information flow, which is of course crucial to every function of the response organization. Some of the specific questions to look at are:

- Who makes the decision to bring in people and gear and when?
- To whom is this decision communicated?
- How quickly is it acted upon?
- What agencies do the appropriate staff members contact to acquire the needed people or gear?
- Who keeps records of what equipment is en route, and how much it will cost?

Documentation

The evaluation team will keep a close eye on documentation because it is as important to the evaluation process as it is to the play of the

exercise. The quality of the evaluation, and to a large extent the usefulness of the exercise, is directly proportional to the quality of the documentation.

In the standard ICS organization, the primary responsibility for documentation lies with the Information Management group, which is part of the UC staff. Of course, all cells must document major events and decisions. At the basic level, documentation should allow the evaluation team (or outside investigators in the case of a real incident) to reconstruct everything that happened and determine the logic and information on which all major decisions were based.

All cells should keep watch logs and communications logs. The communications log will record all information passed or received. Paper traces, or some similar type of visual display of the oil slick and all assets, would be of great use both for documentation purposes and to help the UC keep the "tactical picture" during exercise play. The utility of any computer-based information management system used by the response organization should also be assessed.

Data and record keeping requirements must be worked out between the evaluation director and the exercise control team before the exercise, to ensure that all logs and records needed for the evaluation are being collected during exercise play.

Evaluation process

In this section, we will describe the overall evaluation methodology and discuss the personnel and data needed to perform the evaluation.

General methodology

The key features of exercise evaluation are objectivity and openness. If some things in the Area Contingency Plan don't work, or personnel aren't able to execute the plan, the evaluation must point this out. Better to know now what doesn't work than later, when the cost could be disastrous.

Simply stated, the general evaluation procedure is:

- Observe events and collect data
- Reconstruct and analyze
- Document results (through briefings and a report).

The evaluation will, of course, document *what* happened, in as much detail as possible. The evaluation team should also try to determine *why* things happened, and *why* decisions were made. To do this, it must analyze information-related issues and the decision-making process. During the exercise, the evaluators should carefully note the logic and information on which major actions were based.

The evaluation should avoid subjective remarks which can't be backed up with examples or facts. The aim is to evaluate the response system and its component tactics—not the performance of individuals.

Our methodology for evaluating the San Diego PREP Area Exercise was basically that which we regularly use in our analyses of fleet exercises. We placed members of our evaluation team throughout the

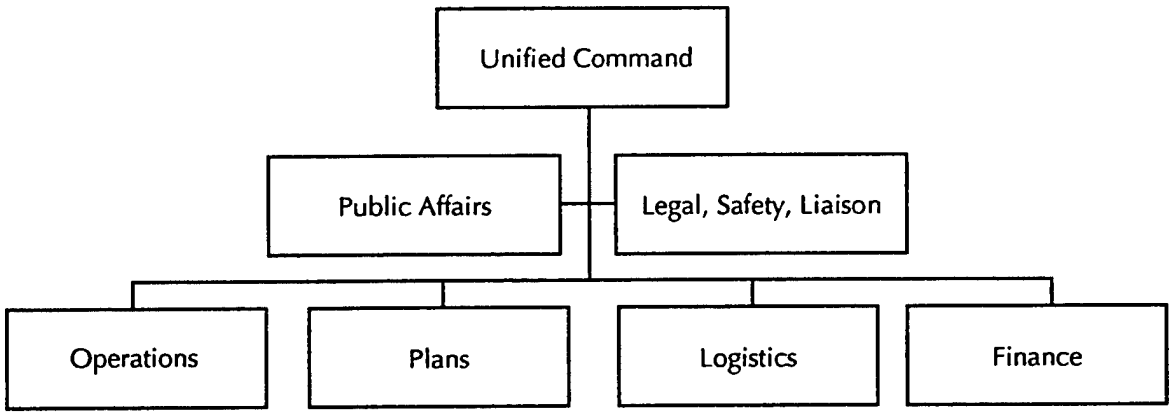
response organization to observe events and take notes. At the end of the exercise, we collected copies of logs maintained in the various cells, copies of status boards and press briefings, and participated in debriefs of players. A few members of our evaluation team remained on site for about a week after the exercise to reconstruct events and prepare a rough draft evaluation report. The evaluation director consolidated all inputs and then completed the report.

Reference [2] describes our San Diego evaluation methodology in more detail, and includes lists of suggested events that the evaluators in each cell should look for. Reference [3] is the San Diego formal evaluation report.

Evaluator assignments

To observe events and understand the response organization, members of the evaluation team must be placed in the main cells of the response organization. Figure 2 shows suggested evaluator coverage. In addition, evaluators should be placed at the scene of the accident (if there is one in the exercise) to observe immediate response, and at the local Coast Guard Marine Safety Office, to monitor notifications and immediate Coast Guard actions.

Figure 2. Evaluator coverage



Evaluators should be in position early, in order to observe the mobilization process. During exercise play, they should take extensive notes, recording the time of all observations. These notes should allow a reader to understand what each cell was doing and why they were doing it.

To prepare for the exercise, all members of the evaluation team should read, at a minimum:

- The PREP guidelines [1]
- The Area Contingency Plan
- The responsible party's facility plan (in the case of a Navy-led exercise, the facility plan and the NOSC plan).

Most importantly, evaluators must remember to think of the big picture. As they observe events during exercise play, they should try to tie events to the thing that really matters: the ability of the responding group/organization to effectively respond to the oil spill.

Required data

It is critical that the exercise design team require all cells to keep watch logs and communications logs, documenting all actions and information passed and received. Because communications will be over regular telephones, the evaluators in each cell will not hear conversations, so communications logs are especially important for tracking the flow of information.

Any charts or paper traces showing locations of the oil slick and response assets would be extremely helpful.

A basic fact of exercise reconstruction and evaluation is that the quality of the evaluation product is highly dependent on the quantity and quality of the information made available to the evaluation team. In summary, the following are required for an effective evaluation:

- Extensive evaluator notes
- Copies of all logs and briefings, including:

- — Cell watch logs
- — Cell communication logs
- — Press briefings

- Copies of all status boards
- All paper traces/charts used to track the spill.

References

[1] *National Preparedness for Response Exercise Program (PREP) Guidelines.* Joint publication of the Department of Transportation, U.S. Coast Guard and Research and Special Programs Administration, the U.S. Environmental Protection Agency, and the Department of the Interior. Aug 1994

[2] CNA *San Diego Area PREP Exercise Evaluation Methodology and Plan,* by Ronald Filadelfo, Bayo Adedeji, and Robert Miles (PCCI, Inc.), in *San Diego 1995 PREP Exercise Handbook,* Commander Naval Base, San Diego, Sep 1995

[3] Ronald Filadelfo, Bayo Adedeji, and Robert Miles (PCCI, Inc.). *San Diego 1995 Preparedness for Response Exercise Program (PREP) Exercise Evaluation Report,* forthcoming (CNA Research Memorandum 95-192)

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